INTER-BROOD MOVEMENTS OF JUVENILE SPRUCE GROUSE

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Juvenile tetraonids form broods during most of their first summer of life. Undoubtedly this contact between parent and offspring has survival value for the chicks, particularly during development of thermoregulation and perhaps for acquisition of learned behavior. Presumably, a brood consists of a single family, yet a survey of 26 theses and published reports pertaining to brood size and behavior of tetraonids revealed 10 in which the author suspected broods contained chicks from different hens (Lehmann 1941, Wing et al. 1944, Bump et al. 1947:293, Patterson 1952:135, Bendell 1955, Chambers and Sharp 1958, Dalke et al. 1963, Bendell and Elliott 1967, Braun and Rogers 1971, Harju 1974). But the evidence is based only on observations of juveniles of different sizes or estimated ages or, supposedly, an excess number of chicks. Inter-brood movements among tetraonids apparently do not occur on the massive scale reported for aquatic birds (Beard 1964, Gorman and Milne 1972). There is little known about the frequency of occurrence and circumstances surrounding inter-brood movements of grouse.

Herein I document inter-brood movements of juvenile Spruce Grouse (*Canachites canadensis*), calculate their frequency of occurrence, and briefly question the function of broods remaining as individual units over a long period of time.

METHODS

Data were gathered from marked birds incidental to a population study at Gorge Creek (GC) and Blue Rock Creek (BRC), 27–32 km west of Turner Valley, Alberta from 1970 through 1973. Grouse were located by repeatedly searching the study areas with trained pointing dogs. All hens with broods known to be on the study areas were captured and marked. Numbers of juveniles and their survival were determined from counts of brood size and records of marked individuals. Young chicks were marked with numbered wing tags (size no. 1, National Band and Tag, Newport, Ky.); leg bands were used after about 40 days of age. Juvenile age was determined by growth of primaries (McCourt and Keppie 1975).

RESULTS

The efficiency of tagging grouse is shown in Table 1. In 3 of the 4 summers, over 50% of the maximum number of juveniles seen were marked by 14 days of age and about 80% by 42 days of age. All juveniles that survived until the end of the brood period were marked by that time.

Broods were seen on 428 occasions in 4 years: in only 8 instances (2%)

Table 1

Percentages of Juvenile Spruce Grouse Marked by 7, 14, 28, and 42 Days of Age, 1970–73

Age of bird (days)	Year and Area				
	1970		1971	1972	1973
	GC (66)* (53)**	BRC (30) (24)	GC (103) (97)	GC (88) (84)	GC (89) (77)
7	6	0	35	43	39
14	9	3	56	58	54
28	32	13	70	68	71
42	52	23	84	81	79

* Maximum number of different juveniles sighted.
** Number juveniles marked in brood period.

were 2 found within 50 m of each other (Table 2), but brood ranges were not mutually exclusive. Nineteen % of the occupied habitat (all years) was included in overlap, i.e., within home ranges of different hens. Some habitat was within the home range of up to 4 families. In one instance (GC, 1971), 6 broods were present on a 108 ha plot, and although 37% of the area was used by 2 or more broods only 2% (1/44) of the sightings were of 2 broods together. In all years, overlap of brood ranges probably was greater than recorded because sightings of broods were limited.

Among the 8 occasions that 2 broods were together, 33 juveniles were already tagged and 32 of these were seen with the same hen at a later date. The remaining juvenile joined the second hen when the 2 broods came together. In one sighting of 2 broods, both hens simultaneously called to their chicks from adjacent trees yet the 4 marked juveniles were seen later with the "correct" adult.

There were 12 instances of 11 marked juveniles (7 females, 4 males) moving from a total of 7 broods. Four of the 7 hens were known or assumed to have died. Three juveniles moved from 3 other hens that remained alive, but one of these juveniles was previously orphaned. In all cases in which the hen remained alive (3) only one juvenile moved to a new brood; the only instances (2) of siblings moving together to a new family occurred when the original hen died. All 11 juveniles were at least 11 days old when mixing occurred and all joined broods that occupied overlapping or adjacent home ranges. Ten of these juveniles (91%) survived until at least the end of summer. Survival beyond summer was not determined because many juveniles dispersed in autumn.

Seven hens were known or assumed to have died while with juveniles; 6

TABLE 2

SUMMARY OF BROOD SIGHTINGS AND INTER-BROOD MOVEMENTS OF JUVENILE SPRUCE GROUSE, 1970–73

	Year and Area					
	1970					
	GC	BRC	1971 GC	1972 GC	1973 GC	All Yrs
Size of area (km^2)	5.2	1.6	6.8	6.8	6.8	–
No. broods[1]	15	6	20	20	18	79
broods/km^2	2.9	3.8	3.9	3.9	3.5	–
No. contacts with broods	57	28	118	121	104	428
No. sightings of 2 broods/contact	1	2	1	2	2	8
% of total	1.8	7.1	0.8	1.7	1.9	1.9
No. juveniles alive after about 2 weeks of age	56	29	69	50	62	266
No. marked juvs. known to change broods	1	1	4	1	4	11
% of total	1.8	3.5	5.8	2.0	6.5	4.1

[1] Broods are excluded if all chicks were lost early.

deaths were at least 11 days after hatch (11–22, 17–22, 17–30, 40, 40–43, and 54 days). In this sample, the probable number of chicks alive when the hens died was 27, of which 20 (74%) were still alive at the end of summer (2 others died from handling). By contrast, a hen died at 4–9 days post-hatch and her 3 chicks were not seen again. This brood was rather isolated and if the juveniles did not die at the same time as the hen they may have had difficulty locating another family.

Although data are limited and not clear-cut, the "need" for orphaned juveniles to seek out a new brood may have varied with age. In 3 broods the hen died before 30 days post-hatch; juveniles in 2 of these joined new families within 9 days, and juveniles in the third brood were captured with a new hen 28 days after the death of the hen. A brood count suggested juveniles in this latter brood were present in a new brood 10 days after the original hen died. Three broods were orphaned after 40 days of age and the juveniles were seen later as intact units without a hen. Juveniles of one of these latter broods were without a new hen for at least 26 days, and only one of the 7 chicks then joined a new family; juveniles in the other 2 broods remained together for 8 and 11 days until they dispersed.

The frequency of brood interchange was calculated from the number of juveniles remaining after about 2 weeks of age (Table 2) because this probably excludes most of the high losses from natural mortality (Zwickel

and Bendell 1967). Four % of the juveniles surviving beyond about 2 weeks of age were known to join other broods. At GC, slightly greater mixing occurred in 1971 and 1973 and resulted from several siblings, rather than one chick per brood, moving to other families.

DISCUSSION

Although brood ranges of Spruce Grouse were not mutually exclusive, there were few documented exchanges of juveniles between broods. Proportions of juveniles recorded changing broods probably were overestimates for the cohort hatched unless considerable mixing occurred before chicks were marked.

The frequency of 2 broods coming together likely was greater than recorded, but when considered on a temporal basis such gatherings probably still constituted a small proportion of the brood period. Call notes seemingly function to maintain contact between hen and chicks (Zwickel 1967, this study), and individuality of call notes might facilitate proper reorganization when broods come together. Although there were few records of 2 broods together, the observation that juveniles reunited with their respective parent, coupled with individuality of sound, generates the question of whether survival of a juvenile is enhanced by staying with its respective mother. At least short term survival was good for juvenile Spruce Grouse that changed broods; survival also was good for juveniles that were orphaned. Survival of orphaned juveniles might be age related, requiring the full development of thermoregulation, and for young chicks (<2 weeks old) the proximity of another brood might be critical to survival.

Several authors have speculated on causes of inter-brood movements of grouse, such as the death of a hen (Bump et al. 1947:293), a loose feeding formation and lack of an efficient rallying call (Lehmann 1941), and a concentration of broods (Wing et al. 1944, Bendell 1955). Bendell (1955) further suggested weather as the ultimate cause, by its influence on plant growth and distribution of preferred feeding sites. Death of hen Spruce Grouse seemed to be a cause for juveniles switching broods, but perhaps only when juveniles were young. There was no evidence of a weak cohesion among family members, concentration of broods, nor preferred or localized feeding sites. I do now know whether densities of broods in this study were high for Spruce Grouse; they were generally as high or higher than densities recorded by others (Ellison 1974, McCourt 1969). It is open to question whether higher densities might reduce the effectiveness of calling for maintaining brood organization, resulting in greater exchange of juveniles. There was no effect of movements between broods in summer on mean brood size. Many juveniles temporarily join other families while dispersing in autumn

(Keppie, unpubl. data) and biases on counts of brood size would be greatest at that time.

Whether a specific mechanism or simple chance accounts for separation of grouse broods (Bendell and Elliott 1967, Zwickel 1973, Godfrey 1975; this study) is unknown. Dispersion of broods may result from other factors operating earlier during courtship and nesting. Perhaps brood dispersion enhances survival of the chicks, but present data on survival until autumn for juveniles switching broods do not support this idea. If juveniles that move to a different brood survive, and if juveniles of a certain age can live without a hen, we should focus attention on the purpose of the dispersion pattern and why hen and chicks maintain contact longer than seems necessary.

SUMMARY

Inter-brood movements of juvenile Spruce Grouse were recorded in Alberta from 1970 through 1973. Although brood ranges were not mutually exclusive, broods generally maintained their original constituency. Only 4% of the marked juveniles changed broods; they moved from 7 broods and in 4 cases the hen had died. All juveniles that moved were at least 11 days old and all joined a family in the immediate vicinity. Juveniles that changed broods or which were orphaned survived well until autumn. Although data are limited on the fate of juveniles that mix or which are orphaned, the question arises as to why broods exist as individual units for perhaps longer than necessary to ensure survival of the chicks.

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